



Announcement of Opportunity NNH19ZDA0100

Discovery 2019 CSR Evaluation Plan

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Approval

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Signed copy on file

Introduction

Created in 1992, the Discovery Program sponsors frequent, cost-capped solar system exploration missions with highly focused scientific goals. The program has funded and developed 14 missions to date, including MESSENGER, Dawn, Stardust, Deep Impact, Genesis, GRAIL, and InSight, with Lucy and Psyche currently in development. The Planetary Missions Program Office at NASA's Marshall Space Flight Center in Huntsville, Alabama manages the program for the agency's Science Mission Directorate.

The purpose of this evaluation plan is to define the ground rules, processes, organizations, and schedules to be used in evaluating the Discovery 2019 Concept Study Reports (CSRs).

Four Missions were selected for Concept Studies, which constitute each investigation's Concept and Technology Development Phase (Phase A) of the Formulation process as outlined in NPR 7120.5E, NASA Spaceflight Program and Project Requirements.

\$3M and 9 months were allocated for each Concept Study.

Evaluation Plan Overview

- The Discovery 2019 Announcement of Opportunity (AO NNH19ZDA010O), under which the investigations to be evaluated were selected, was issued on April 1, 2019.
- The Science Office for Mission Assessments (SOMA) at NASA Langley Research Center (LaRC) developed this Discovery 2019 CSR Evaluation Plan for the Science Mission Directorate (SMD) at NASA Headquarters.
- This CSR Evaluation Plan has been cleared for public release by SMD.
- The Discovery 2019 Program Scientist is responsible for validating all evaluation processes, responsibility assignments, assumptions, and ground rules.

Discovery 2019 Missions Selected for Concept Study

Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging Plus (DAVINCI+), PI: James Garvin, NASA Goddard Space Flight Center

DAVINCI+ will analyze Venus' atmosphere to understand how it formed, evolved and determine whether Venus ever had an ocean. DAVINCI+ plunges through Venus' inhospitable atmosphere to precisely measure its composition down to the surface.

Io Volcano Observer (IVO), PI: Alfred McEwen, University of Arizona

IVO would explore Jupiter's moon, Io, to learn how tidal forces shape planetary bodies. Using close-in flybys, IVO would assess how magma is generated and erupted on Io.

Trident, PI: Louise Prockter, Johns Hopkins University Applied Physics Laboratory

Trident would explore Triton, a unique and highly active icy moon of Neptune, to understand pathways to habitable worlds at tremendous distances from the Sun. Using a single fly-by, Trident would map Triton, characterize active processes, and determine whether the predicted subsurface ocean exists.

Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy (VERITAS), PI: Suzanne Smrekar, Jet Propulsion Laboratory

Orbiting Venus with a synthetic aperture radar, VERITAS would map Venus' surface to determine the planet's geologic history and understand why Venus developed so differently than the Earth.

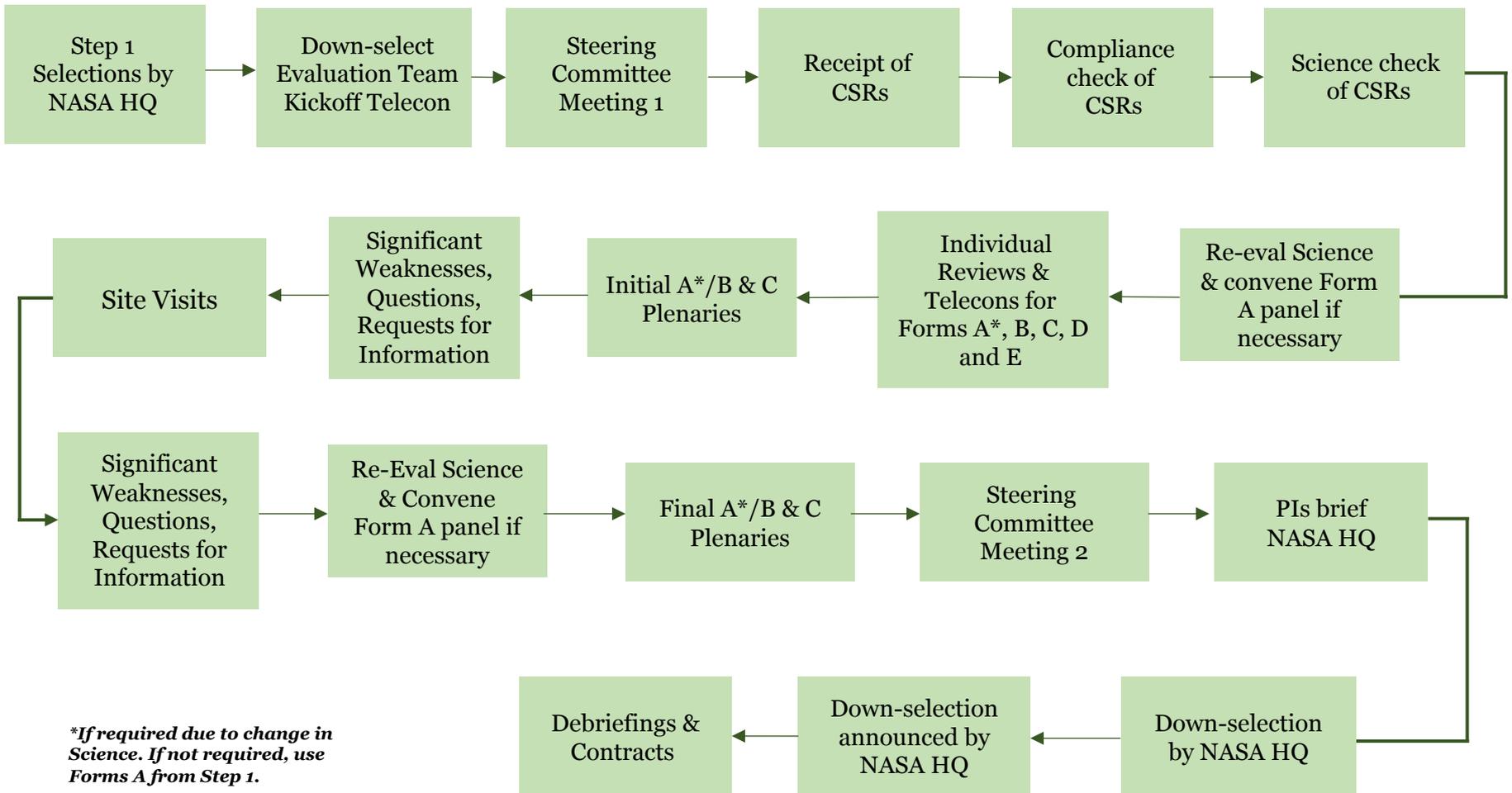
Handling of Proprietary Data

- All CSR related materials will be considered proprietary.
- Only those individuals with a need to know will be allowed to view CSR materials.
- Each non-Civil Servant (CS) or non-Intergovernmental Personnel Act (IPA) Assignee Evaluator will sign a NASA Non-Disclosure Agreement (NDA) which must be on file with NASA prior to any CSRs being distributed to that evaluator.
 - CS and IPA Evaluators are not required to sign an NDA.
- All Report Materials in hardcopy format will be numbered and controlled, and a record will be kept of who has been supplied with what materials, both electronic and hardcopy.
- Evaluators and Observers will be briefed at a Kickoff telecon on how to handle the CSR material. Evaluators will be briefed that they are not allowed to discuss CSRs with anyone outside the Evaluation Panels ever, unless authorized by NASA. Evaluators will be briefed to not contact anyone outside of their Evaluation Panel to gain insight on any CSR related matter without expressly getting authorization from the Discovery Program Scientist (Dr. Thomas Wagner) or the Technical, Management, and Cost (TMC) Panel Chair in advance of making the contact.
- SPD-17 detailing Observers at Review Panels will be followed. Observers will not have access to CSR or evaluation materials.

Handling of Proprietary Data (continued)

- During the Evaluation, all proprietary information that needs to be exchanged between evaluators will be transferred securely via the Remote Evaluation System (RES) website maintained by SOMA, via the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES), via NASA Google docs, via the secure ScienceWorks system maintained by SMD, via controlled WebEx, via NASA's Large File Transfer (LFT) capability, or via encrypted email, parcel post, fax, or regular mail. Proprietary information will not be sent via unencrypted email.
- Telecon line information is confidential. The phone numbers and pass codes are posted in a file on the Remote Evaluation Site (RES). Participants will be briefed to ensure they do not provide this information to anyone or distribute this information via email.
- When the evaluation process is complete, CSR materials will be collected. Some copies (for archival purposes) will be maintained by the Program Scientist at NASA HQ, and in the SOMA vault. Also, all CSR material from the down-selected mission(s) will be provided to the Planetary Missions Program Office at MSFC. All other CSR materials will be destroyed.
- Evaluators' electronic and paper evaluation materials will be deleted/destroyed when the evaluation process is complete. Archival copies will be maintained in the NASA Science Office for Mission Assessments (SOMA) vault.

Proposal Evaluation Flow



Evaluation Organization

Leadership Team

Dr. Thomas Wagner, Program Scientist
NASA Headquarters

Ms. Andrea Riley, Program Executive
NASA Headquarters

Ms. Odilyn Luck, Lead Acquisition Manager
SOMA NASA Langley Research Center

Science Panel (Forms A & B)
Chair: Dr. Thomas Wagner
Bradley Zavodsky, Deputy

TMC Panel (Form C)
Chair: Odilyn Luck
Dr. Carlos Liceaga, Deputy

Student Collaboration
(Form D)
Chair: Dr. Nancy Chanover

Small Business
Subcontracting (Form E)
David E. Brock

Plan to Avoid Conflicts of Interest (COIs)

- Members of Evaluation Panels are cross checked against the draft list of organizations and individuals provided by the study teams to ensure no individual or organizational COI exists with the planned evaluators. Evaluators are required to raise any potential COIs.
- After the Concept Study Reports (CSRs) are received, all members of the Evaluation Panels will again be cross checked against the final lists of organizations and individuals on each CSR to ensure no individual or organizational COI exists on the list of evaluators.
- In addition, all evaluators will review the final lists of conflicted organizations and individuals and be required to divulge whether they have any financial, professional, or personal potential conflicts of interest and whether they work for a profit-making company that directly competes with any profit-making proposing organization.
- Community standards for conflicts of interest will be applied to all evaluators as directed in SMD Policy Document SPD-01A, *Handling Conflicts-of-Interest for Peer Reviews*. Standards for financial conflicts of interest as specified in 18 U.S.C. § 208 will be applied to Civil Servant evaluators. The HQ Office of General Counsel will be consulted as necessary.
- Any potential COI issue is discussed with the Discovery Program Scientist and the SMD Deputy Associate Administrator for Research, and documented in the Discovery Downselect COI Mitigation Plan.

Plan to Avoid COIs (continued)

- All Civil Service evaluators will self-certify their COI status by reviewing a combined listing of individuals and organizations associated with the CSRs. The TMC evaluators must notify the TMC Panel Chair in case there is a potential conflict. The Science evaluators must notify the Science Panel Chair in case of a potential conflict.
- If any evaluators with potential organizational COI must be used, their respective organizations must submit a plan, as required by their contract or SMD waiver, addressing the COI and mitigation plan. This plan will outline how they will firewall the potentially conflicted evaluator(s) during the evaluation process from the conflicted part of their organization.
- If during the evaluation there is any actual conflict of interest noted, the conflicted member(s) will be notified to stop reviewing CSRs immediately and the Discovery Program Scientist will be notified. Steps will be expeditiously taken to remove any actual or potential bias imposed by the conflicted member(s).

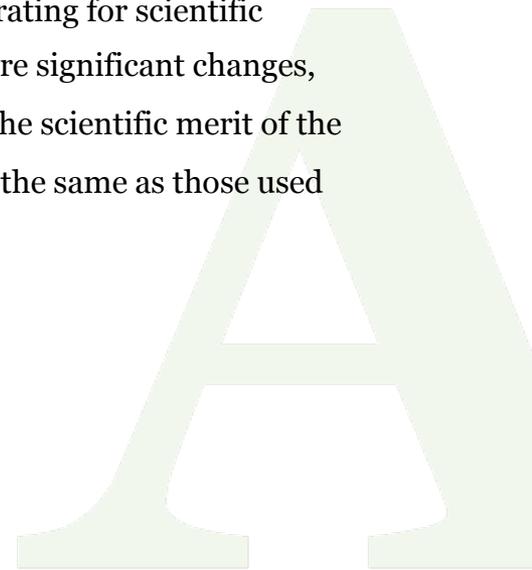
Evaluation Criteria and Additional Selection Factors

- The Criteria to evaluate the Concept Study Reports are documented in the **Discovery 2019 GUIDELINES AND CRITERIA FOR THE PHASE A CONCEPT STUDY** at:
<https://discovery.larc.nasa.gov/dpl.html>
- **Evaluation criteria for the Concept Study:** approximate significance of each criterion is indicated by the percent weighting.
 - **Criterion A:** Intrinsic Scientific/Technology Merit of the Proposed Investigation (will not be re-evaluated unless it is determined that the science has changed from that described in the Step 1 proposal) (approximately 20%)
 - **Criterion B:** Experiment Scientific/Technology Implementation Merit and Feasibility of the Proposed Investigation (approximately 40%)
 - **Criterion C:** TMC Feasibility of the Proposed Mission Implementation (approximately 40%)
- **Additional Selection Factors that may be considered by the Selection Official**
 - **Criteria D and E:** Quality of plans for optional Student Collaboration (SC), if proposed, and small business subcontracting plans.
 - NASA budget changes and/or other programmatic factors, including but not limited to changes in scientific mandates, national priorities, and budgetary forecasts that were not evident when the Discovery AO was issued.
 - The PI-Managed Mission Cost.
- **Science Enhancement Option (SEO) and Technology Demonstration Opportunity (TDO) Factors**
SEO factor is described on page 18, TDO factors on page 28. Selection of any SEO and/or TDO shall be separate from selection of any primary mission and will not be included in the weighting above.

Evaluation Criterion A

Scientific Merit of the Proposed Investigation:

The Lead Discovery Program Scientist will determine whether any issues that may have emerged in the course of the concept study have effected significant changes to the science objectives or other aspects of the proposed Baseline and Threshold Science Missions (see Requirement CS-17 in Section II of this document) in such a manner as to have impacted the basis for the evaluation of the scientific merit of the investigation as determined by the peer review panel for the Step 1 proposal. If there are no significant changes to the proposed investigation that undermine the basis of this rating, the peer review panel rating for scientific merit of the Step 1 proposal will be the rating for scientific merit of the CSR. If there are significant changes, the Lead Discovery Program Scientist will convene a peer review panel to reevaluate the scientific merit of the objectives in light of these changes. The factors for re-evaluating this criterion will be the same as those used for the Step 1 proposal review (Section 7.2.2 of the AO).



Evaluation Criterion B

Scientific Implementation Merit and Feasibility of the Proposed Investigation: All of the factors defined in Section 7.2.3 of the AO apply to the evaluation of the CSR. Note that details have been added to one of the subfactors of Factor B-1, Merit of the instruments and mission design. Also, an additional subfactor has been added to Factor B-2, Probability of technical success.

Factor B-1. Merit of the scientific implementation in supporting the scientific goals and objectives. This factor includes the appropriateness of the proposed mission architecture, instruments, and measurement techniques for addressing the goals and objectives; how well the anticipated measurements support the goals and objectives; *the degree to which the proposed instruments and mission can provide the necessary data, including details on data collection strategy and plans* (n.b., items in italics added for the evaluation of the CSR); and the appropriateness of the mission requirements for guiding development and ensuring scientific success.



Evaluation Criterion B (continued)

Factor B-2. Probability of technical success. This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team—both institutions and individuals—to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design. *This factor includes assessment of technology readiness, heritage, environmental concerns, accommodation, and complexity of interfaces for the instrument design (n.b., subfactor in italics added for the evaluation of the CSR).*

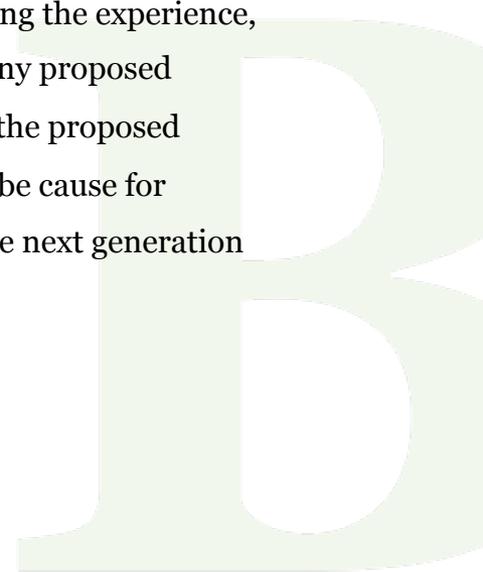
Factor B-3. Data adequacy, sufficiency, analysis, and archiving. This factor includes the degree to which the proposed mission and instruments can provide the necessary data, particularly the adequacy of the quality and quantity of data provided by the investigation to complete the investigation and meet the proposed science goals and objectives and result in the publication of science discoveries in the professional literature. Additionally, this factor includes the merit of plans for data analysis, data archiving, cartography, and/or sample analysis and curation to meet the goals and objectives of the investigation and to preserve data and analysis samples of value to the science community. Considerations in the assessment each of these plans include adequate resources (e.g., budget, schedule, equipment) and the timely execution of the plans, especially for release to the public domain of data usable to the entire science community (and associated high-level data products and software) and/or samples for enlarging the science impact.

Evaluation Criterion B (continued)

Factor B-4. Science resiliency. This factor includes both developmental and operational resiliency.

Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.

Factor B-5. Probability of science team success. This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is who do not have a well-defined and appropriate role may be cause for downgrading during evaluation. The inclusion of career development opportunities to train the next generation science leaders will also be evaluated.



Evaluation Criterion B (continued)

- A new evaluation factor that is not described in the AO and was not evaluated for Step 1 proposals will also be included. This factor will be evaluated for the CSRs in addition to the factors specified in Section 7.2.3 and Section 7.2.2 of the AO repeated or updated above as Factors B-1 through B-5.

Factor B-6. Maturity of proposed Level 1 science requirements and Level 2 project

requirements. This factor includes assessment of whether the Level 1 requirements are mature enough to guide the achievement the objectives of the Baseline Science Mission and the Threshold Science Mission, and whether the Level 2 requirements are consistent with the Level 1 requirements. The CSR will be evaluated for whether the requirements are stated in unambiguous, objective, quantifiable, and verifiable terms that do not conflict. The CSR will be evaluated for the adequacy, sufficiency, and completeness of the Level 1 and Level 2 requirements, including their utility for evaluating the capability of the instruments and other systems to achieve the mission objectives. The stability of the Level 1 science requirements and Level 2 project requirements will be assessed including whether the requirements are ready, upon initiation of phase B, to be placed under configuration control with little or no expected modifications for the lifecycle of the mission.

Any impact to the primary mission due to the inclusion of Technology Demonstration Opportunities (TDOs) and/or Science Enhancement Options (SEOs) will also be included in the factors above.

SEO Factor

Merit of any SEOs, if proposed. This factor includes assessing the appropriateness of activities selected to enlarge the science impact of the mission; the potential of the selected activities to enlarge the science impact of the mission; and the appropriate costing of the selected activities. The peer review panel will also separately discuss and verify to NASA that the evaluation of the proposed SEO(s) did not impact the overall rating for Scientific Implementation Merit and Feasibility of the baseline investigation. Lack of an SEO will have no impact on the overall rating for scientific implementation merit and feasibility.

The SEO evaluations will be reported on forms separate from those for the baseline investigation, and will be delivered separately to the Selection Official.

SEO

Evaluation Criterion C

TMC Feasibility of the Proposed Investigation Implementation:

- All of the factors defined in Section 7.2.4 of the AO apply to the evaluation of the CSR. All of these factors are interpreted as including an assessment as to whether technical, management, and cost feasibility are at least at a Phase A level of maturity.
- Note that an additional subfactor has been added to Factor C-2, Adequacy and robustness of the mission design and plan for mission operations. Clarifications have been made to two subfactors and one subfactor added to Factor C-4, Adequacy and robustness of the management approach and schedule, including the capability of the management team. Also, the risk management aspects of Factor C-4 have been removed from Factor C-4 and included in a new evaluation factor, Factor C-6, Adequacy of the risk management plan.

Evaluation Criterion C (continued)

Factor C-1. Adequacy and robustness of the instrument implementation plan. The maturity and technical readiness of the instrument complement will be assessed, as will the ability of the instruments to meet mission requirements. This factor includes an assessment of the instrument design, accommodation, interface, heritage, and technology readiness. This factor includes an assessment of the instrument hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of the instrument complement. This factor also includes adequacy of the plans for instrument systems engineering and for dealing with environmental concerns. This factor includes an assessment of plans for the development and use of new instrument technology, plans for advanced engineering developments, and the adequacy of backup plans to mature systems within the proposed cost and schedule when systems having a TRL less than 6 are proposed.

Evaluation Criterion C (continued)

Factor C-2. Adequacy and robustness of the mission design and plan for mission operations. This factor includes an assessment of the overall mission design and mission architecture, the spacecraft design and design margins (including margins for launch mass, delta-V, and propellant), the concept for mission operations (including communication, navigation/tracking/trajectory analysis, and ground systems and facilities), and the plans for launch services. *This factor includes an assessment of the scientific measurements planning and decision-making processes (including any priorities assigned to specific measurements and plans to update the measurement strategy based on early measurements), and the schedule and workforce allocated to these processes (n.b., subfactor in italics added for the evaluation of the CSR).* This factor includes mission resiliency—the flexibility to recover from problems during both development and operations—including the technical resource reserves and margins, system and subsystem redundancy, and reductions and other changes that can be implemented without impact to the Baseline Science Mission.

Evaluation Criterion C (continued)

Factor C-3. Adequacy and robustness of the flight systems. This factor includes an assessment of the flight hardware and software designs, heritage, and margins. This factor includes an assessment of the proposer's understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.). This factor includes an assessment of the adequacy of the plans for spacecraft systems engineering, qualification, verification, mission assurance, launch operations, and entry/descent/landing. This factor includes the plans for the development and use of new technology, plans for advanced engineering developments, and the adequacy of backup plans to ensure success of the mission when systems having a TRL less than 6 are proposed. The maturity and technical readiness of the spacecraft, subsystems, and operations systems will be assessed. The adequacy of the plan to mature systems within the proposed cost and schedule, the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks, and the likelihood of success in developing any new technologies will be assessed. *NASA-developed technologies offered in the AO will be included in this factor to the extent described in AO Table 4 (n.b., subfactor in italics added for the evaluation of the CSR).*

Evaluation Criterion C (continued)

Factor C-4. Adequacy and robustness of the management approach and schedule, including the capability of the management team. This factor includes: the adequacy of the proposed organizational structure and WBS; the management approach including project level systems engineering; the roles, qualifications, and experience of the PI, PM, *PSE, DPI(s)* (*n.b.*, item in italics added for the evaluation of the CSR), other named Key Management Team members, and implementing organization, mission management team, and known partners; the commitment, spaceflight experience, and relevant performance of the PI, PM, *PSE, DPI(s)* (*n.b.*, item in italics added for the evaluation of the CSR), other named Key Management Team members, and implementing organization, mission management team, and known partners against the needs of the investigation; the prior working relationships of the implementing organization and known partners; the commitments of partners and contributors; and the team's understanding of the scope of work covering all elements of the mission, including contributions. This factor also includes assessment of elements such as the relationship of the work to the project schedule, the project element interdependencies, the associated schedule margins, and an assessment of the likelihood of meeting the proposed launch readiness date. Also evaluated under this factor are the proposed project and schedule management tools to be used on the project, *along with the subcontracting plan including small and small disadvantaged businesses* (*n.b.*, subcontracting plan subfactor, in italics, added for the evaluation of the CSR). The inclusion of career development opportunities to train the next generation engineering and management leaders will also be evaluated.

If tailoring of program and project management requirements is proposed, evaluators will comment on the CSR team's justification for that tailoring, but will not consider it a part of the risk rating.

Evaluation Criterion C (continued)

Factor C-5. Adequacy and robustness of the cost plan, including cost feasibility and cost risk. This factor includes elements such as cost, cost risk, cost realism, and cost completeness including assessment of the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work (covering all elements of the mission). The adequacy of the cost reserves and understanding of the cost risks will be assessed. This factor also includes an assessment of the proposed cost relative to estimates generated by the evaluation team using parametric models and analogies. Also evaluated under this factor are the proposed cost management tools to be used on the project.

Evaluation Criterion C (continued)

The following evaluation factor has been removed as a subset of Factor C-4 described in the AO and has been revised for the evaluation of the CSR.

Factor C-6. Adequacy of the risk management plan. The adequacy of the proposed risk management approach will be assessed, as will any risk mitigation plans for new technologies, any long-lead items, and the adequacy and availability of any required manufacturing, test, or other facilities. The approach to any proposed descoping of mission capabilities will be assessed against the potential science impact to the proposed Baseline Science Mission. The plans for managing the risk of contributed critical goods and services will be assessed, including the plans for any international participation, the commitment of partners and contributors as documented in Letters of Commitment, and the technical adequacy of contingency plans, where they exist, for coping with the failure of a proposed cooperative arrangement or contribution; when no mitigation is possible, this should be explicitly acknowledged. The stability and reliability of proposed partners, and the appropriateness of any proposed contribution, is not assessed as a management risk but will be assessed by SMD as a programmatic risk element of the investigation.

Evaluation Criterion C (continued)

- The following are new evaluation factors that are not described in the AO and were not evaluated separately for Step 1 proposals. These will be evaluated for the CSRs in addition to the factors given in Section 7.2.4 of the AO repeated or updated above as Factors C-1 through C-6.
 - **Factor C-7. Ground Systems.** This factor includes an assessment of the proposed mission operations plans, facilities, hardware and software, processes, and procedures.
 - **Factor C-8. Approach and feasibility for completing Phase B.** The completeness of Phase B plans and the adequacy of the Phase B approach will be assessed. This assessment will include evaluation of the activities/products, the organizations responsible for those activities/products, and the schedule to accomplish the activities/products.
 - **Factor C-9. Implementation feasibility and risk of any proposed use of NASA-developed technology.** The proposed infusion of NASA-developed technology described in Section 5.9.3 of the AO will be assessed including whether the plan adequately interfaces with, integrates, and uses the NASA-developed technology.
- Any impact to the primary mission due to the inclusion of TDO(s) and/or SEO(s) will also be included in the factors above.
- For the purposes of the CSR, investigation teams are not required to hold reserves against Government Furnished Equipment (GFE) such as a NASA-provided launch service. They should assume the Government will deliver as promised on factors such as Launch Vehicle (LV) performance and schedule. The Government is holding separate reserves on its promises.

TDO Factors

TDOs will be evaluated using the same criteria as the baseline investigation, as applicable, with the following additions:

- TDOs will be assigned Criterion B and Criterion C ratings independent of the baseline investigation.
- An additional TDO factor will be considered on the potential of the TDO(s) to enlarge the scientific impact of the mission, and/or the value to future missions of demonstrating the selected technology.
- An additional TDO factor will be considered on the separability of the TDO, both at Step 2 downselect and subsequent phases of the mission.
- An additional TDO factor will be considered on the TDO accommodation approach, including but not limited to the definition of requirements, developmental risks, and overall costs.

The TDO evaluations will be reported on forms separate from those for the baseline investigation, and will be delivered separately to the Selection Official.

TDO

Evaluation Criteria D & E

The following are new evaluation factors that are not described in the AO and were not evaluated for Step 1 proposals. These will be evaluated for CSRs.

D & E

Evaluation Criterion D

Overall Merit of Student Collaboration (SC):

- This factor will include an assessment of whether the scope of the SC follows the guidelines in Section 5.5.3 of the AO. The factors to be used to evaluate the SC component and a discussion of those factors are described in the SMD Policy Document on Student Collaboration (SPD-31), which can be found in the Discovery Program Library.
- There is no minimum and no maximum allowable cost for a SC. However, NASA is providing a student collaboration incentive of 1% of the PI-Managed Mission Cost. If the SC costs NASA more than the student collaboration incentive, then the rest of the cost of the SC must be provided via contribution(s) and/or from the PI-Managed Mission Cost.

The SC incentive was amended from \$5M FY2019 to 1% of the PI-Managed Mission Cost.

Evaluation Criterion E

Merit of the Small Business Subcontracting Plans:

This factor will be evaluated on the participation goals and quality and level of work performed by small business concerns overall, as well as that performed by the various categories of small business concerns listed in FAR 52.219-9.



CSR Evaluation Panel Products

Form A (if necessary) and Form B for all CSRs

- Grades: Excellent, Very Good, Good, Fair, or Poor
- Polling is held for the 5 categories above
- The reported grade reflects the median

Form C for all CSRs

- Grades: Low, Low/Medium, Medium, Medium/High, or High
- Polling is held for the 5 categories above
- The reported Risk Rating grade reflects the median

Form D (Student Collaboration)

- Separable from the main mission: Yes or No
- Grades: Meritorious or Not Meritorious

Form E (Small Business Subcontracting Plans)

- Grades: Acceptable or Needs Work

Grade Definitions - Forms A and B

Form A and B Grade Definitions

- **Excellent:** A comprehensive, thorough, and compelling CSR of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
- **Very Good:** A fully competent CSR of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any weaknesses.
- **Good:** A competent CSR that represents a credible response to the AO, having neither significant strengths nor weaknesses and/or whose strengths and weaknesses essentially balance.
- **Fair:** A CSR that provides a nominal response to the AO, but whose weaknesses outweigh any perceived strengths.
- **Poor:** A seriously flawed CSR having one or more major weaknesses (e.g., an inadequate or flawed plan of research or lack of focus on the objectives of the AO).

Evaluators are polled on the grades defined above.

Definitions of Criterion A*/B Findings

Major Strength: A facet of the response that is judged to be well above expectations and substantially contributes to the Science Implementation Merit and Feasibility of the Investigation.

Minor Strength: A strength that substantiates the Science Implementation Merit and Feasibility of the Investigation.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially detract from the Science Implementation Merit and Feasibility of the Investigation.

Minor Weakness: A weakness that detracts from the Science Implementation Merit and Feasibility of the Investigation.

Unlike in Step 1, minor findings can influence risk ratings. Significant minor findings are those minor findings that do influence risk ratings and are specifically identified in evaluation forms, and will be marked as such in the Form B. The term “Significant Weakness” includes both Major Weaknesses and Significant Minor Weaknesses.

**If required due to change in Science. If not required, use Forms A from Step 1.*

Science Feasibility Impact

- The Science Feasibility Impact of Criterion B Major Weaknesses will be considered.
 - **Factors B-1 to B-5:**

“This weakness is anticipated to have a {small, modest, serious} impact on the ability of the proposed mission to achieve {some, all} of {one, several, all} science objective(s).”
 - **Factor B-6:**

“This weakness is anticipated to have a {small, modest, serious} impact on the ability to measure progress of the proposed mission in achieving {some, all} of {one, several, all} science objective(s).”
- Goal is to be clear on the severity of a Criterion B Major Weakness.

Risk Ratings Definitions - Form C

The following definitions are indicators of risk. Evaluators must consider these definitions and input available for their consideration (e.g., cost model applicability, uncertainty of the cost models error bars and schedule analyses, uncertainty of the cost threats, mitigating factors such as major strengths, etc.) together with their judgment in determining the appropriate risk for a particular mission.

Rating	Definition
Low Risk	Resources for technical, management, schedule, and cost are at or above the appropriate levels, with at least one resource significantly above, even after taking into account any problems that have been identified in the Phase A evaluation. No risks with unquantified cost threats* have been identified.
Low/Medium Risk	No problems have been identified in the Phase A evaluation that reduce the technical, management, schedule, and cost resources below the appropriate levels. Any identified risks with unquantified cost threats have a low probability of occurrence.
Medium Risk	Problems have been identified in the Phase A evaluation that reduce one of the resources slightly below the appropriate levels for: technical, management, schedule, or cost. Sound management and effective application of engineering resources will be required to solve the problems. Any identified risks with unquantified cost threats have a probability of occurrence that is not high.
Medium/High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified may not be solvable within the resources proposed, even with the use of sound management and effective application of engineering resources.
High Risk	Problems have been identified in the Phase A evaluation that reduce one or more of the resources significantly below the appropriate levels for: technical, management, schedule, and/or cost. The problems identified are deemed unsolvable within the resources proposed.

**Risks with unquantified cost threats are defined in the grades above as those major weaknesses whose cost to fix cannot be quantified, but is large. The impacts of these risks are significant because they could lead to not achieving the baseline mission with the resources available.*

Criterion C Panel Evaluation Principles

- **Basic assumptions for Step 1:**
 - Proposing team is the expert on their proposal.
 - Proposing team's task is to provide evidence that the project is Low Risk.
 - Criterion C Panel's task is to try to validate proposing team's assertion of Low Risk.
 - Proposing team given the benefit of the doubt.
- **CSR Feasibility and Risk Assessment in Step 2:**
 - Tasks are the same as for Step 1, but expectations are higher.
 - Study team's task is to provide evidence that the project is Low Risk.
 - Criterion C Panel's task is to try to validate study team's assertion of Low Risk.
 - The study team is not given the benefit of the doubt in the down-select.
- All CSRs will be reviewed to identical standards.
 - All CSRs shall receive same evaluation treatment in all areas.
- The Criterion C Panel is made up of evaluators who are subject matter experts in the areas of the CSRs that they evaluate.
- The Criterion C Panel develops findings for each CSR that are based on individual comments and reflect the general agreement of the entire panel.
 - Comments that are *as expected* are not included as findings. Comments that are *above expectations* result in strengths.
 - Comments that are *below expectations* result in weaknesses.

Definitions of Criterion C Findings

Major Strength: A facet of the response that is judged to be well above expectations and can substantially contribute to the ability to meet technical commitments on schedule and within cost.

Major Weakness: A deficiency or set of deficiencies taken together that are judged to substantially affect the ability to meet the proposed technical objectives within the proposed cost and schedule.

Minor Strength: A strength that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Minor Weakness: A weakness that is substantial enough to be worthy of note and brought to the attention of study team in debriefings.

Unlike in Step 1, minor findings can influence risk ratings. Significant minor findings are those minor findings that do influence risk ratings and are specifically identified in evaluation forms, and will be marked as such in the Form C. The term “Significant Weakness” includes both Major Weaknesses and Significant Minor Weaknesses.

Cost Evaluation

- All information from the entire evaluation process will be considered in the final cost assessment.
- An independent cost verification of the proposed cost for Phases A-D will be performed using three independent cost models.
- An independent cost verification of the proposed cost for Phase E will be performed using at least two cost models.
- The evaluation will assess the cost risk, cost realism, and cost completeness, including the basis of estimate, the adequacy of the approach, the methods and rationale used to develop the estimated cost, the discussion of cost risks, the allocation of cost reserves by phase, and the team's understanding of the scope of work.
- The likelihood and cost impact of significant weaknesses and cost analysis findings will be assessed.
- Cost threat impacts to the proposed unencumbered reserves will be assessed (see Cost Threat Matrix slide 39).
- The adequacy of the remaining unencumbered reserves will be assessed.
- Draft Forms C and Cost Evaluation Summaries (CESSs) will be completed on all CSRs prior to the Initial Form C Plenary.
- During the Form C Plenaries, the entire panel will participate in Cost deliberations.
- All significant Cost Findings will be included on the Form C and considered in the TMC Risk Rating.

Cost Threat Matrix

- The *likelihood* and *cost impact*, if any, of each weakness is stated as “This finding represents a cost threat assessed to have a Unlikely/Possible/Likely/Very Likely/Almost Certain likelihood of a Very Minimal/Minimal/Limited/Moderate/Significant/Very Significant cost impact being realized during development and/or operations, which results in a reduction from the proposed unencumbered reserves.”
- The *likelihood* is the probability range that the cost impact will materialize.
- The *cost impact* is the current best estimate of the range of costs to mitigate the realized threat.
- The cost threat matrix below defines the adjectives used to describe the *likelihood* and *cost impact*.
- The *minimum* cost threat threshold is \$1M.

		Cost Impact (CI) % of PI-Managed Mission Cost (PIMMC) to complete Phases A/B/C/D or Phase E not including unencumbered cost reserves or contributions					
		Very Minimal 0.25% < CI ≤ 2.5% (\$0M < CI ≤ \$0M) 1% < CI ≤ 2.5% (\$0M < CI ≤ \$0M)	Minimal 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M) 2.5% < CI ≤ 5% (\$0M < CI ≤ \$0M)	Limited 5% < CI ≤ 10% (\$0M < CI ≤ \$0M) 5% < CI ≤ 10% (\$0M < CI ≤ \$0M)	Moderate 10% < CI ≤ 15% (\$0M < CI ≤ \$0M) 10% < CI ≤ 15% (\$0M < CI ≤ \$0M)	Significant 15% < CI ≤ 20% (\$0M < CI ≤ \$0M) 15% < CI ≤ 20% (\$0M < CI ≤ \$0M)	Very Significant CI > 20% (CI > \$0M) CI > 20% (CI > \$0M)
Likelihood (L, %)	Almost Certain (L > 80%)						
	Very Likely (60% < L ≤ 80%)						
	Likely (40% < L ≤ 60%)						
	Possible (20% < L ≤ 40%)						
	Unlikely (L ≤ 20%)						

Note: Each instance of “\$0M” in the table above is converted to dollars according to the associated percentage, on a CSR-by-CSR basis. Depending on proposed PI-Managed Mission Cost, some columns may not apply.

Grade Definitions - Form D, Student Collaboration (SC)

The merit of any Student Collaboration (SC) will be given one of two adjectives: Meritorious, or Not Meritorious

- **Meritorious:** The student collaboration proposed has achievable education goals and objectives and an implementation/oversight/management approach that will provide students with a rich hands-on education experience.
- **Not Meritorious:** The student collaboration proposed has not articulated achievable education goals and objectives and/or the implementation/oversight/management approach limits the likelihood of success for student's opportunities for hands-on experience.

Grade Definitions - Form E, Small Business Subcontracting (SBC)

The merit of the Small Business Subcontracting Plans will be rated as either Acceptable, or Needs Work

- **Acceptable:** The subcontracting plan adequately addresses all required elements of a subcontracting plan, and the proposed subcontracting percentage goals and the quality level of the work to be performed by small business concerns is sufficient.
- **Needs Work:** The subcontracting plan does not address all required elements of a subcontracting plan, or the proposed subcontracting percentage goals and quality of work to be performed by small businesses is not sufficient, and further participation must be negotiated if this mission is selected.

Criteria B & C Panel Evaluation Processes

- Evaluation panel members review assigned CSRs and perform an individual review before discussing findings with other members of the panel.
- The SOMA Remote Evaluation System (RES) will be used for:
 - Entering individual evaluation panel member's comments for Criterion C.
 - Developing draft and final Forms C for each CSR.
 - A repository for all final Forms for the evaluation (Forms B, C, D, and E).
- Only Evaluators who have participated in the Form C Initial Plenary, the Site Visits, and the Form C Final Plenary may participate in polling on Form C.
 - Participation is defined as in person or virtually.
 - Specialist Evaluators* are not polled.
 - Form B form leads may participate in Form C polling.
- NSPIRES and NASA Google docs will be used for:
 - Entering individual evaluation panel members' comments for Criterion B.
 - Developing draft and final Forms B for each CSR.
- Evaluation and polling on Form B will be restricted to Form B Evaluators, with the exception of Form C form leads and Form C instrument experts if designated by the Discovery 2019 Program Scientist as Form B Evaluators.
- Only Evaluators who have participated in the Form B Initial Plenary, ~~the Site Visits,~~ and the Form B Final Plenary may participate in polling on Form B.
 - Participation is defined as in person or virtually

** Specialist Evaluators (to provide special technical expertise to Criterion B/C/D/E Panels) and External/Mail-In Evaluators (to provide special science/technology expertise to the Criterion B Panel) may be utilized, respectively, based on the specific technology and science that is proposed.*

Criteria B & C Panel Evaluation Processes (continued)

Consistency Review for Form C findings and Form B findings.

- **Form C consistency**
 - A Form C Consistency Group will review all Form Cs and questions at the Initial Plenary, and all Form Cs at the Final Plenary.
 - Form C Evaluators will review all CSRs. Specialist Evaluators may review a subset of CSRs.
- **Form B consistency**
 - Form B Consistency Checker(s) will review all Form Bs and questions at the Initial Plenary, and all Form Bs at the Final Plenary.
- **Form B and Form C consistency**
 - At least one Form B Evaluator for each CSR will participate in the Form C discussions for each mission at the plenary meetings
 - Some Form C instrument experts will participate in Form B discussions.
 - Consistency of findings between Forms B and C will be reviewed and adjudicated at the Initial and Final Plenaries.

Initial Plenary

The Initial Plenary is used to identify significant issues related to Criterion B and Criterion C based on the initial evaluation of the CSR. Initial Form Bs and Cs are reviewed.

- The Goal of the Initial Plenary is:
 1. Identify the Major Weakness, Minor Weaknesses, Major Strengths and Minor Strengths of each CSR.
 2. If necessary, develop questions and/or requests for information in addition to the Significant Weaknesses to give each Study Team an opportunity to clarify any misunderstanding.
- The main topic areas are the implementation issues in Criterion B and Criterion C.
- No polling on grades occurs at the Initial Plenary (Criterion B and Criterion C).
- The Significant Weaknesses, Questions, and Requests for Information List (SQRL) will be sent to each Study Team 8 days prior to its Site Visit.
- Criterion D (Student Collaboration) and Criterion E (Small Business Subcontracting) are reviewed as required by Criterion-specific panels prior to the Initial Plenary. Site Visit questions for Criterion D and Criterion E are prepared and provided no later than the Initial Plenary to the CSR Evaluation Chair.

Significant Weaknesses, Questions, and Requests for Information List (SQRL)

- **Site Visits SQRLs**

- All SQRLs developed at the Initial Plenary will be sent to each Study Team 8 days prior to its Site Visit.
- The SQRL is preliminary and may change based on Site Visit information and further discussion by Evaluation Panels.
- Questions may also be sent to the study team or verbalized during the Site Visit.
- Questions must be of significance to a Form A, B, C, D, or E rating.

- **The Discovery 2019 Program Scientist will approve all SQRLs developed at the Initial Plenary. Three types of responses to SQRLs are planned. These types may be combined for a given Significant Weakness (SW), Question, or RFI.**

- Written response prior to Site Visit: SWs, Questions, or RFIs provided to the Study team that must be addressed in writing prior to the Site Visit. The nature of some SWs, Questions, or RFIs require data that must be reviewed prior to the Site Visit.
 - Written response at Site Visit: SWs, Questions, or RFIs that require documentation, but not extensive review.
 - Oral presentation at Site Visit: SWs, Questions, or RFIs that must be addressed the day of the Site Visit by way of presentation.
- Evaluation Team members will ask questions during the Site Visit to ensure they understand the response to a SW, Question, or RFI, or to clarify any significant issues.

Site Visits

- Site Visits with Oral Briefings will be used to clarify implementation details and commitments. The Study Team may address weaknesses identified in the Concept Study and provide updates on the Concept Study developed after submission of the Concept Study Report.
- Site Visits for Discovery 2019 will be held virtually and dates are negotiated with the PI.
- Briefings at each Site Visit will be limited to a total of 7 hours with 1 additional hour for a virtual site tour or demonstration, and 15 additional minutes for SC if necessary, not including break times. Due to the impact of COVID-19, site visits will be held virtually over two days. Two hours per day will be allotted to allow for breaks and to address connectivity issues. The suggested schedule is **10:30 am to 4:15 pm** in the **Eastern** time zone ~~designated by the PI.~~
- All Site Visit presentations/briefings should be in a plenary session with all Evaluation Team members attending – no splinter sessions – unless authorized by the Discovery 2019 Program Scientist or TMC Panel Chair.
- A written SQRL will be submitted to the PI 8 days before the Site Visit. All teams will have the same lead time.
- As part of the Site Visit process, NASA may send additional SQRLs to Study Teams ~~the day~~ on the Monday after their respective Site Visits, and possibly during the Final Plenaries, if necessary, to resolve any issues or clear up potential misunderstandings. Responses will typically be due within 4 days for post-Site Visit SQRLs, and within 24 hours for the Final Plenary SQRLs.
- All information provided by the Study Team is relevant to the evaluation. Information contained in the CSR, information presented during the Site Visit; and information provided in response to SQRLs will all be considered and will be treated as updates and clarifications to the CSR during the evaluation.

Final Plenary Products

- Finalize all evaluation Forms based on the information in the CSRs, as well as updates to the CSRs and clarifications.
- Both Major and Minor Strengths and Weakness will be considered in the Grade for all Forms.

Form B

- Polling will be held twice on the Form B grade. The final polling is recorded. For the final polling, the individual grades are recorded and the median grade is calculated and recorded as the final polling. A median score that falls between two grades will be reported as the combination of those two grades (e.g., 10 Good votes and 10 Fair votes = Good/Fair grade. If there is a divergence of opinion, there may be additional rounds of discussion and polling.
- Significant Weaknesses, Questions, and/or Requests for Information generated during the Final Plenary may result in additional rounds at or after the Final Plenary.

Form C

- Form C will be reviewed three times. Polling will be held twice on the Form C risk rating. The final polling is recorded and reported. For the final polling, the individual grades are recorded, the median calculated and the final grade recorded which reflects the Form C risk rating of the median of the polling. A median score that falls between two risk ratings will be “rounded” to the higher risk rating.
- If there is a divergence of opinion, there may be additional rounds of discussion and polling.
- Significant Weaknesses, Questions, and/or RFIs generated during the Final Plenary may result in additional rounds at or after the Final Plenary.

Form D, Student Collaboration

- Representatives from the SC Panel will consider the Merit of proposed Student Collaborations.

Form E, Small Business Subcontracting

- MSFC Procurement Personnel will evaluate this criterion.

Observers and Transition Briefing

- CSs, IPAs, and Contractors with downstream implementation responsibilities may attend panel meetings and Site Visits as Observers.
- All invited observers must be approved by both the SMD Program Officer and Deputy Associate Administrator for Research.
 - Observers must comply with SMD Policy Document SPD-17, *Statement of Policy on Observers at Panel Reviews of Proposals*. This policy will be provided to all approved observers.
- Approved Observers include (this list will be updated as Observers are approved):
 - Clayton Kachele, Planetary Missions Program Office, MSFC
 - The above listed Program Office individuals are invited due to their positions in organizations which will oversee implementation of the down-selected mission(s). Their participation as Observers will provide early knowledge of any potential implementation challenges for the down-selected mission(s).
 - Heather Watson, Program Scientist, Science Mission Directorate, NASA HQ
- After down-selection is announced, Transition Briefings will be provided by a subset of the Evaluation Team to CSs, IPAs, and Contractors in the Program Offices and at NASA HQ who have implementation responsibilities.

Change Log

#	Date	Change
0	August 18, 2020	Baseline
1	September 18, 2020	<ul style="list-style-type: none"> Page 42, Removed the requirement for Site Visit participation in order to participate in polling on Form B
2	October 21, 2020	<ul style="list-style-type: none"> Page 2, signatory for Planetary Science Division changed to Eric Ianson Page 9, added Janet Letchworth as Chair of Student Collaboration evaluation panel Page 46 <ul style="list-style-type: none"> Changed suggested Site Visits time to 10:30a.m. to 4:15p.m. Designated Eastern Time zone for Site Visits Changed post-visit SQRLs send-out day to the Monday after the Site Visit.
3	February 16, 2021	<ul style="list-style-type: none"> Page 9, Nancy Chanover, Chair of Student Collaboration evaluation panel Page 48, added Clayton Kachele and Heather Watson as Observers to panel meetings and Site Visits.

